

WSDOT Project Mitigation Costs Case Studies

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**Washington State
Department of Transportation**

Highway Construction Project Mitigation Costs

WSDOT highway projects primarily aim to improve the safety and capacity of roadways and extend their use. Almost every project, however, also requires ancillary undertakings to square the project with other public goals, such as clean water requirements or protection of wetlands and endangered species. These other undertakings are the “mitigation” without which a highway project would not happen and its transportation aims would not be realized.

These case studies present mitigation experience of fourteen actual highway projects. They are designed to illuminate two questions:

What is the cost of mitigation for highway projects in Washington State?

Are mitigation undertakings and costs reasonable in relation to project objectives?

Some believe that environmental and other mitigation costs of WSDOT’s highway projects are “too high.” Generally, “too high” seems to imply that mitigation features, such as noise walls or stormwater detention ponds, are too expensive or too elaborate. The case studies describe the mitigation features provided for specific projects, how much they have cost, and what has caused them to be incorporated into the projects. With this information, the “too high or not” question can be answered.^[1]

When planning projects and obtaining their permits, it is generally accepted that, as much as possible, negative impacts, such as environmental impacts, will be *avoided*. Impacts that cannot be avoided will be *minimized*. Any remaining negative impacts, however minimal, will be *mitigated*. Documents like the project EIS help describe for citizens and other agencies exactly how impacts will be *avoided*, *minimized*, and *mitigated*.

^[1] The costs of processing environmental assessments and permit applications may also be reflected in the studies, as the data collected includes the expense of preparing environmental documentation. The study does not address costs in time of project delays due to environmental requirements.

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Specific plans for mitigation generally take shape as WSDOT works with other agencies at federal, tribal, state and local levels to develop specific conditions to reconcile a project with requirements that grow from concerns about negative impacts on natural resource protection and other public values. Often these conditions are expressly written into the project's legally required permits, for example under the Clean Water Act or the Shoreline Management Act. Permit conditions might include wetland restoration, stormwater runoff control facilities, conservation of historic properties, noise walls, and even special traffic management plans to minimize construction interruption for neighboring businesses. A few of the case studies also describe features and costs incurred on a project for the specific purpose of actually avoiding an impact, such as the placement of bridge abutments in a flood plain. Mitigation features and costs vary enormously from project to project.

WSDOT shares the responsibility with regulatory agencies for seeing that project mitigation is reasonable and properly meets legal requirements specified in, for example, environmental protection statutes and regulations. The permitting process is a challenging forum in which the byplay of shared responsibility is carried out.

This report presents data on mitigation costs of 14 projects that have recently been constructed or are planned for construction in the near future. Of the projects studied, five are basically interchange projects, seven are highway widening or lane additions, and the other two are preservation projects (bridge and roadway rehabilitation). Seven of the projects were essentially completed in the '01-'03 biennium. Four are underway and are expected to be completed later in 2003. Three are expected to go into construction in the '03-'05 biennium.

For the most part, the mitigation features for these projects fall into four major categories:



Stormwater Facilities



Wetland Restoration



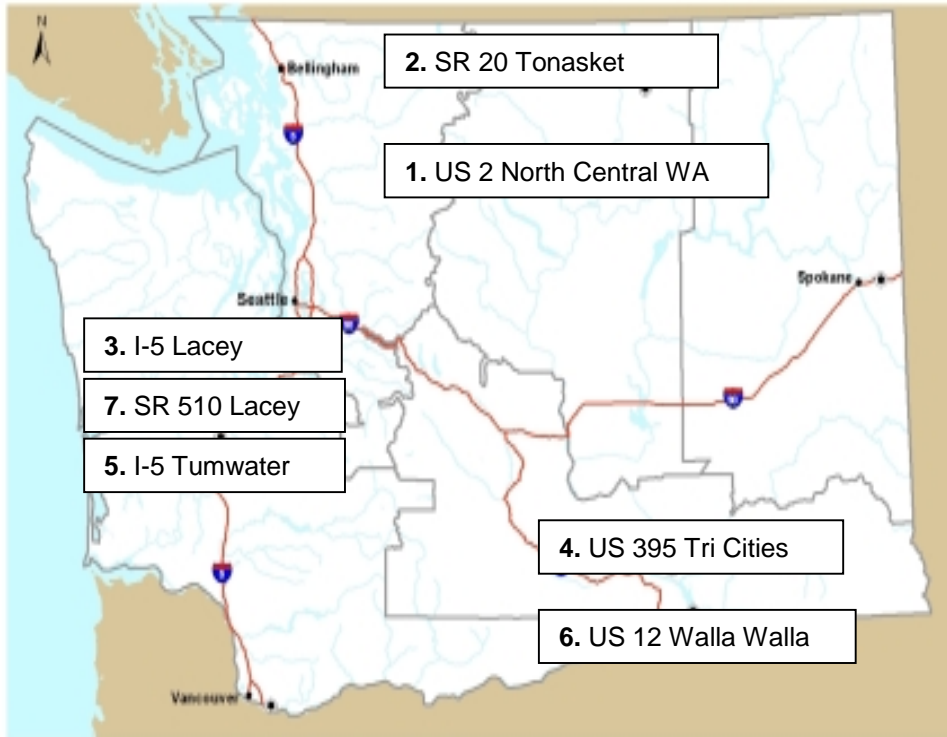
Noise Walls



Stream Protection

The total mitigation feature costs represented in this report are all-inclusive of costs for each element of mitigation. The mitigation feature costs include:

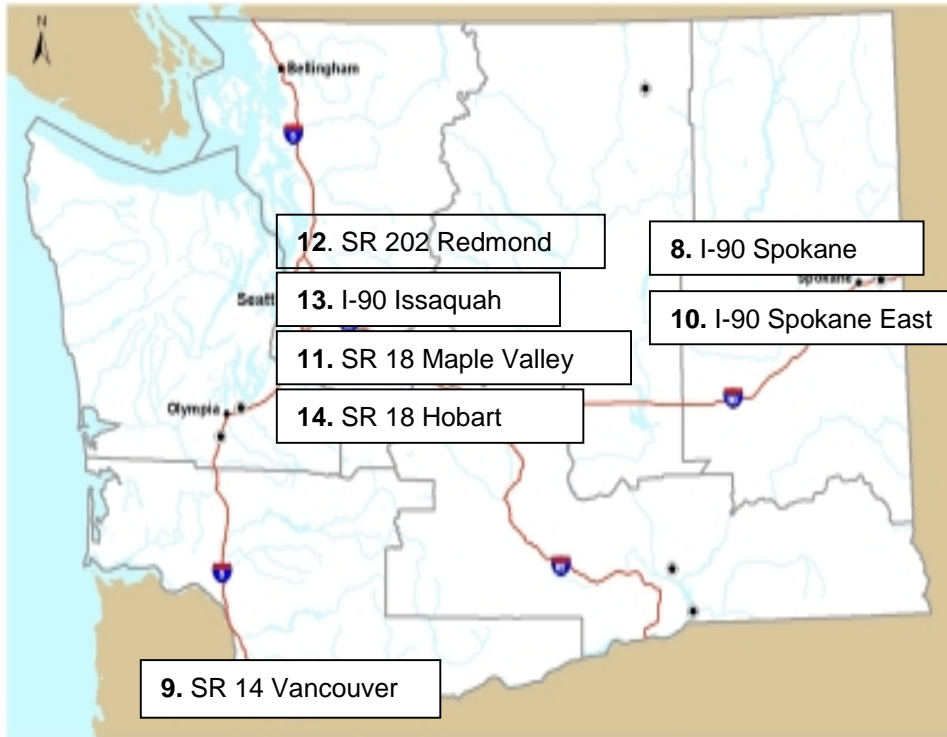
- Construction cost (actual cost from bid document or engineer's estimate).
- Allocated share for state sales tax, generally estimated to be approximately 8% add-in to overall construction contract amount.
- Right of way (actual acquisition cost).
- Allocated share of contractor's mobilization, usually estimated to be approximately 10% of overall construction amount.
- Allocated share of WSDOT cost for construction engineering and administration; add to project cost an amount equal to 6-14% of construction contract amount.
- Allocated share of WSDOT Planning and design; add to project cost an amount of 5-15% of the overall project costs.



Project Case Studies

1. **US 2/20/153 North Central Washington
Scour Repairs on Seven Bridges**
Repaired scour on 7 existing bridges in North Central Washington.
Project cost: **\$0.28 M**
20% of total project cost for stream re-vegetation and restoration.
2. **SR 20 Tonasket
Bannon Creek to Aeneas Valley Rd**
Rebuilt a 2-lane roadway and replaced 2 bridges.
Project cost: **\$4.32 M**
6% of total project cost for wetland mitigation and livestock access.

3. **I-5 Lacey
SR 5 Overcrossing**
Revised existing interchange and ramps.
Project cost: **\$7.96 M**
4% of total project cost for mitigation of stormwater.
4. **US 395 Tri Cities
Hillsboro St.**
Construct a new interchange and ramps.
Project cost: **\$12.17 M**
10% of total project cost for mitigation of stormwater.
5. **I-5 Tumwater
Maytown to 93rd Ave. 5th & 6th Lanes**
Widened 2 miles of I-5 from 4 to 6 lanes.
Project cost: **\$11.22 M**
15% of total project cost for mitigation of stormwater.
6. **US 12 Walla Walla
McNary Pool to Attalia**
Added 2 lanes to create a 3-mile, 4-lane highway.
Project cost: **\$10.20 M**
30% of total project cost for wetland mitigation and recreational improvements.
7. **SR 510 Lacey
Martin Way to Pacific Ave.**
Widened SR 510 from 3 to 5 lanes for 1.5 miles.
Project cost: **\$16.06 M**
14% of total project cost for mitigation of stormwater runoff.



Project Case Studies

8. I-90 Spokane

Evergreen Rd. I/C

Build a new interchange and ramps.

Project cost: **\$16.2 M**

12% of total project cost for mitigation of traffic noise and stormwater runoff

9. SR 14 Vancouver

SE 192nd Ave. Interchange

Construct an interchange and rebuild Brady Rd.

Project cost: **\$19.78M**

2% of total project cost for mitigation of stormwater.

10. I-90 Spokane East

Argonne to Sullivan Interstate Widening

Add 2 lanes to I-90 in Spokane for 2 miles.

Project cost: **\$ 36.12 M**

10% of total project cost for mitigation of traffic noise and stormwater

11. SR 18 Maple Valley

180th Ave. to Maple Valley

Created a 4-mile, 4-lane, divided roadway.

Project cost: **\$37.67 M**

21% of total project cost for mitigation of traffic noise, stormwater runoff, and impacts to wetlands and streams.

12. SR 202 Redmond

SR 202 – SR 520 to Sahalee Way

Widen SR 202 for 3 miles.

Project cost: **\$61.83**

24% of total project cost for mitigation of traffic noise, stormwater runoff, and impacts to wetlands and streams.

13. I-90 Issaquah

Sunset Way Interchange

Construct a new interchange and ramps.

Project cost: **\$112.80 M**

12% of total project cost for mitigation of stormwater runoff, and impacts to wetlands, streams, and bike and pedestrian trails.

14. SR 18 Hobart

Maple Valley to Issaquah Hobart Rd.

Created a 4-mile, 4-lane, divided roadway.

Project cost: **\$82.08 M**

34% of total project cost for mitigation of stormwater runoff, and impacts to wetlands and streams.

	Total Project Cost in millions	Total Mitigation Costs in millions	% of project cost spent on mitigation
Scour Repairs on Seven Bridges	\$0.28	\$0.06	20%
SR 20 Tonasket	\$4.32	\$0.28	6%
I-5 Lacey	\$7.96	\$0.29	4%
US 395 Tri-Cities	\$12.17	\$1.16	10%
I-5 Tumwater	\$11.22	\$1.66	15%
US 12 Walla Walla	\$10.20	\$3.03	30%
SR 510 Lacey	\$16.06	\$2.26	6%
I-90 Spokane	\$16.20	\$1.96	12%
SR 14 Vancouver	\$19.78	\$1.14	6%
I-90 Spokane East	\$36.12	\$3.54	10%
SR 18 Maple Valley	\$37.67	\$7.84	21%
SR 202 Redmond	\$61.83	\$15.17	24%
I-90 Issaquah	\$112.80	\$18.40	12%
SR 18 Hobart	\$82.08	\$27.93	34%

This table shows that no clear pattern emerges for the scale of mitigation costs in relation to overall project size. The location and setting of the specific projects in relation to neighborhoods, streams, and wetland are much more critical factors. In general, the most expensive projects to mitigate are west of the Cascades. But not all west side projects fit that pattern.

US 2/20/153 Scour Repairs on Seven Bridges

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Hydraulic Project Approval (HPA) Clean Water Act Section 404 Growth Management Act Critical Area Ordinances Shoreline Management Act Ecology Surface Water Quality	WDFW ACOE County Gov. County Gov. Ecology	Stream Protection	\$55,000	20%	Construction equipment in the streams, rivers and riparian areas



The total cost of this project was \$278,000.

This project repaired scour on seven existing bridges in rural areas of North Central Washington. These repairs included placing heavy, loose rip rap (rocks) around the piers. Projects such as this one are difficult to permit because they involve placing equipment and materials in the stream itself.



The mitigation for the project consisted of undertakings for stream revegetation and stream restoration in areas where the contractor's machinery had worked. The direct cost of that work was only \$19,000. The cost of obtaining the permits for the work was approximately \$36,000. In fact, permitting difficulties with one county actually foreclosed the opportunity for the contractor to work on one of the intended seven bridges in the contract time period. A change order had to be issued deleting that bridge from the construction contract. The work was done two years later by a separate maintenance contract, after permit issues were finally resolved,.

SR 20, Tonasket, Bannon Creek to Aeneas Valley Road

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 404 Shoreline Management Act Clean Water Act Section 402 Hydraulic Project Approval Ecology Surface Water Quality	ACOE County Gov. Ecology WDFW Ecology	Wetlands Restoration	Construction \$158,000 Right of Way \$ 23,000 Engineering \$88,000 Total Cost \$269,000	6%	Construction of earth embankment impacted existing wetlands and buffers



The total project cost was \$4,320,000.

This project, located in a rural area near Tonasket, rebuilt a two-lane roadway for approximately 4 miles.

One foot of surfacing was added to the roadway and slopes were rebuilt. The slope work impacted 1.5 acres of existing wetland. To mitigate for this impact we created 2.5 acres of new wetland. The cost of this mitigation was \$269,000.



I-5 Lacey, Marvin Road Interchange

Mitigation Driver	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$290,000	6%	Addition of new impervious surface required treatment for stormwater. All stormwater treatment facilities were located in existing right of way.



The total cost of the project was \$7,960,000.

This project revised an existing interchange, built a new bridge and ramps, and added auxiliary lanes in the urban area of Lacey.



The project was required to incorporate stormwater treatment facilities for approximately 225,000 square feet of impervious surface. This was accomplished by constructing new swales and ponds on existing right of way. The total cost for the stormwater treatment features of the project was \$ 290,000.

US 395 Tri Cities, Hillsboro Street Interchange

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$210,000	2%	Addition of new impervious surface required treatment for stormwater. All stormwater treatment facilities were located in existing right of way.
Clean Air Act	Benton Clean Air Authority/ Ecology	Rock placement on slopes to control wind-blown dust	\$950,000	8%	Slope protection rock was needed for fugitive dust control.



This project improves the critical US 395 corridor in the Tri-Cities by replacing an existing at-grade intersection with a new bridge, interchange, and ramps. The total project cost is approximately \$12.17 million.

The project created approximately 11.4 acres of new impervious surface. Stormwater control facilities consisting of stormwater ponds were able to be placed on existing right of way within the footprint of the ramps. The area receives only about 8 inches of rainfall per year. The cost was \$210,000.



Because of the arid and windy conditions and the poor prospects for establishing plant cover around the new facilities, the permit for compliance with Clean Air Act concerns for windblown dust contained a requirement for rock placement on slopes to hold the soil in place. This rock placement on the slopes resulted in a mitigation cost of approximately \$950,000, or about 8% of total project cost.

I-5 Tumwater, Maytown to 93rd Ave. 5th and 6th Lanes

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$1,660,000	15%	Addition of new impervious surface required treatment for stormwater. Additional right of way required for stormwater treatment.

The total cost of the project was \$11,220,000.



This project, located in a rural area south of Tumwater, widened the existing four-lane interstate to six lanes for approximately two miles. It added four lane miles, a wider shoulder, and a median barrier. Prior to construction, stormwater partially drained into the existing grassy median. New stormwater facilities had to be constructed both for the new roadway and to replace what was lost by filling in the median.



This project was originally designed in 1996-97 and then sat on the shelf waiting for funding. When the project moved toward a construction start in 2001, changed federal and state stormwater policies required a redesign of the entire drainage and pond system, duplicating some of the original design cost.

Ultimately, the new facilities, consisting principally of a new 1.2-acre detention pond, were constructed on an area that had to be added to the right of way. The all-in cost, including design, right of way, and construction was approximately \$1.66 million.

US 12 Walla Walla, McNary Pool to Attalia

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Hydraulic Project Approval (HPA) Clean Water Act Section 404 Growth Management Act Critical Area Ordinances Clean Water Act Section 401 Clean Water Act Section 402 Ecology Surface Water Quality	WDFW ACOE County Gov. Ecology Ecology Ecology	Wetlands Restoration	\$3,030,000	28%	Mitigation is needed for roadway widening impacting existing wetlands. Wetland mitigation is taking place on ACOE land, which holds right of way costs down.



This project widens a 3-mile section of US 12 from 2 to 4 lanes, in a rural area of Walla Walla County. It is one phase of a multi-phase project that will ultimately add 2 lanes to US 12, for a total of 12.2 miles.

The mitigation features in this phase – wetland restoration on the nearly 21-acre Two Rivers mitigation site, a boat launch, dike breach, and construction of new wetland benches – have been accepted as the mitigation for wetland impacts on the entire 12.1 mile corridor. The impairment caused by this project affects 9.6 acres of vegetated wetlands and 4.7 acres of open water.



The total project cost for the 3-mile phase is \$10,800,000.

Although the 21-acre mitigation site for wetlands restoration is not on WSDOT right of way, the site is owned by the Army Corps of Engineers and no cost was incurred for right of way acquisition. Because of the arid climate, no expense was incurred for separate stormwater facilities other than vegetated side slopes and ditches.

At 28% of the project cost, the mitigation costs incurred in this 3-mile phase seem high, but they will eventually be spread across the entire 12.2 miles project.

SR 510 Lacey, Martin Way to Pacific Avenue

Mitigation Drivers	Agency	Mitigation Feature	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$2,260,000	14%	Addition of new impervious surface required treatment for stormwater. Additional right of way required for stormwater treatment.



Currently under construction



The total cost for this project is estimated to be \$16,060,000.

This project, located in urban Lacey, involves grading and paving work, to widen approximately 4.3 miles of existing roadway to 3 lanes or 5 lanes.

The mitigation required for this project fell entirely into the area of stormwater facilities for treatment of the runoff resulting from the added impervious surface. Right of way acquisition of residential and commercial property for the three ponds cost approximately \$1 million, a significant portion of the overall \$2.26 million stormwater mitigation costs.

I-90 Spokane, Evergreen Road Interchange

Mitigation Driver	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$1,870,000	11.5%	Addition of new impervious surface required treatment for stormwater.
FHWA Noise Abatement	FHWA	Noise Walls	\$90,000	0.6%	
		Totals	\$1,960,000	12.10%	



This project, located in an urban area of Spokane, included a new interchange, bridge, ramps, and auxiliary lanes.

Stormwater facilities constructed for the project included stormwater conveyance sewers, runoff swales, and 6 detention ponds. Two of the ponds were oversized so that 2 miles of extra lanes can be added in a later project without requiring additional pond capacity. The facilities were built entirely within existing right of way; no land acquisition costs were incurred. The cost of the stormwater facilities was \$1.87 million out of the total project cost of \$16,200,000.



An environmental assessment and a cost/benefit demonstration showed that a noise wall was needed to buffer noise for nearby residences under FHWA and WSDOT requirements and guidelines. A 1,950 square foot noise wall was constructed at an all-in cost of approximately \$90,000.

SR 14 Vancouver, SE 192nd Avenue Interchange

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402 Hydraulic Project Approval Growth Management Act Critical Area Ordinances Dept. of Natural Resources - Forest Practices	Ecology WDFW Clark County DNR	Stormwater Facilities	\$430,000	2%	Mitigation was needed to treat stormwater from additional impervious surface. The old roadbed was restored to a forested condition and used to treat stormwater.



The total cost for the project was \$19,780,000.

This project, located in a suburban area east of Vancouver, improved approximately 4 miles of SR 14 by constructing a new interchange, ramps, and bridges, and by rebuilding Brady Road to the north of SR 14.



The project added 7.1 acres of new impervious surface and a combination of swales and ponds were required as mitigation for stormwater runoff control. No new right of way was required because all the new stormwater facilities could be located in the old roadway. The cost of four new detention ponds and the other stormwater treatment facilities was about \$ 430,000.

I-90 Spokane East, Argonne to Sullivan Interstate Widening

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Shoreline Management Act Clean Water Act Section 402 Construction Permit and Stormwater Site Plan	Spokane Co. Ecology	Stormwater Facilities	\$1,770,000	5.2%	Addition of new impervious surface required treatment for stormwater.
FHWA Noise Abatement	FHWA	Noise Walls	\$1,840,000	5.5%	
		Totals	\$3,610,000	10.7%	



This project, located in the urban area of Spokane, involves the addition of 2 lanes on I-90 for approximately 5 miles. The design for this project is now on the shelf, awaiting funding for the construction phase. At the time of shelving, the estimated cost of completion was approximately \$33,700,000.

Stormwater runoff and neighborhood noise are the major impact issues.

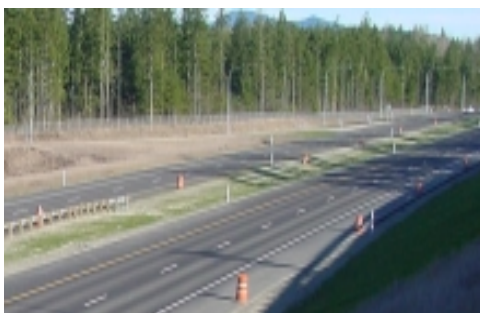
The impervious surface requiring stormwater control facilities totals approximately 38 acres. A rebuilt stormwater system, including ponds, swales, inlets, and pipes, will cost approximately \$1.77 million to construct. The stormwater facilities will be located entirely within pre-existing WSDOT right of way, so no additional cost is incurred on that account.

An environmental assessment showed that a noise wall was needed to buffer noise for nearby residences under FHWA and WSDOT requirements and guidelines. The total cost of the noise walls is estimated at \$1.84 million.



SR 18 Maple Valley, 180th Ave. to Maple Valley

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$2,250,000	6%	Addition of new impervious surface required treatment for stormwater.
Clean Water Act Section 404 Shoreline Management Act Clean Water Act Section 401 Hydraulic Project Approval	ACOE King County Ecology WDFW	Wetlands Restoration	\$610,000	2%	Mitigation is needed for roadway widening impacting existing wetlands.
Hydraulic Project Approval Shoreline Management Act Clean Water Act Section 401	WDFW King County Ecology	Stream Protection	\$3,330,000	9%	Building longer structures was a condition for obtaining a permit.
FHWA Noise Abatement	FHWA	Noise Walls	\$1,420,000	4%	
		Totals	\$7,610,000	21%	



The total cost to complete this project was \$37,670,000. This project, a portion of a larger project to widen SR 18 from Auburn to North Bend, is a 2.7-mile stretch of highway located between Covington and Maple Valley.

The project required provision of stormwater facilities to mitigate runoff impacts from approximately 62 acres of impervious surface. The facilities included a series of detention and infiltration ponds and other features. Right of way acquisitions for locating these facilities cost approximately \$1.296 million, or about 40% of the total value of right of way takings for the project as a whole. Including the right of way costs, the total cost of the facilities for stormwater mitigation was \$2.225 million.



The widening impacted 0.86 acres of existing wetlands. A new 8-acre wetland was created to mitigate for the impacted acreage. This new wetland cost approximately \$610,000.

There are four stream crossings two of them replaced box culverts on the old highway with bridges that were longer than what was functionally required to span the stream to avoid impacts to the stream and habitat.

Environmental assessment of noise impacts to residential neighborhoods also led to construction of approximately 29,520 square feet of noise walls, pursuant to FHWA and WSDOT guidelines, at a total cost of \$1.42 million.

SR 202 Redmond, SR 202 – SR 520 to Sahalee Way

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$4,750,000	8%	Addition of new impervious surface required treatment for stormwater.
Clean Water Act Section 404 Shoreline Management Act Clean Water Act Section 401 Hydraulic Project Approval	ACOE King County Ecology WDFW	Wetlands Restoration	\$7,070,000	11%	Mitigation is needed for roadway widening impacting existing wetlands.
Hydraulic Project Approval Shoreline Management Act Clean Water Act Section 401	WDFW King County Ecology	Stream Protection	\$1,050,000	3%	Building longer structures was a condition of obtaining a permit.
Noise Assessment Study		Noise Walls	\$1,300,000	2%	
		Totals	\$14,170,000	24%	



This project proposes to widen SR 202 between SR 520 and Sahalee Way from the typical existing 2 lanes to a 4-lane roadway with turn lanes.

The estimated cost to build this project is \$61.83 million

Bioswales, detention ponds, and buried detention vaults will be strategically located as stormwater runoff control facilities, mitigating runoff for approximately 14.5 acres of impervious surface. The stormwater facilities will cost approximately \$4.7 million, or \$2.41/sf of impervious area, much higher than the average cost of the projects studied.

This project is difficult from the standpoint of avoidance, minimization, and mitigation of wetland impacts. SR 202 is very close to Evans Creek for part of the alignment and is also near the Turtle floodplain. Widening will impact 3.1 acres of existing wetland. Mitigation will be provided by the construction of a new 10-acre wetland with a 14-acre buffer, for an estimated cost of \$7.07 million. This is a much higher mitigation ratio than other projects in this study.

Cantilevered, longer than existing bridges are planned to avoid impacts to Evans Creek. The direct cost for this avoidance strategy is estimated at \$1.05 million.

29,000 square feet of noise walls are planned, costing approximately \$1.3 million.

I-90 Issaquah, Sunset Way Interchange

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402 Ecology Surface Water Quality Modification	Ecology	Stormwater Facilities	\$6,520,000	6%	Addition of new impervious surface required treatment for stormwater. Over \$5 million spent for right of way for one of the ponds.
Clean Water Act Section 404 Hydraulic Project Approval	ACOE WDFW	Wetlands Restoration	\$1,590,000	1%	Mitigation is needed for roadway widening impacting existing wetlands.
Hydraulic Project Approval	WDFW	Stream Protection	\$1,010,000	1%	Restoration to the riparian due to impacts during construction.
Public Involvement Environmental Impact Statement		Aesthetics	\$2,470,000	2%	Visual mitigation wall and barrier finishes as well as architectural girders.
Clean Water Act Section 402	Ecology	Temporary Erosion and sediment control	\$2,280,000	2%	Condition of a permit to mitigate for sediment and stormwater during construction.
		Totals	\$13,870,000	12%	



Project includes new bridges, ramps, and a bicycle and pedestrian trail. The total project cost is \$112,800,000.

Impervious surface requiring stormwater treatment is 22.1 acres. Two ponds were constructed, one of which required a right of way taking for \$5 million. The total stormwater facilities cost, including right of way, is \$6.5 million.

The project impacted 0.15 acres of wetland and 1.40 acres of buffer. Mitigation consisted of 0.30 acres of new wetlands creation at a site near the project, together with 0.17 acres of wetlands enhancement and 1.40 acres of buffer enhancement. The cost was \$1.59 million.

Location of the project within a National Scenic Byway led to a program to mitigate the visual effect of retaining walls by incorporation of a patterned surface motif into the walls. The added cost was approximately \$0.52 million. Special architectural features were also incorporated into some of the bridge girders at an added cost of approximately \$1.95 million.

Proximity of construction to Issaquah Creek required extraordinary construction efforts for erosion and stormwater runoff controls, as well as special post-impact expenditures for stream restoration and vegetation. The erosion control program included check dams, settling ponds and mechanical filtration. The cost of these construction controls was approximately \$2.28 million. Stream restoration costs are expected to be approximately \$1 million.

SR 18 Hobart, Maple Valley to Issaquah Hobart Road

Mitigation Drivers	Agency	Mitigation Categories	Mitigation Cost	% of the Project	Mitigation Comments
Clean Water Act Section 402	Ecology	Stormwater Facilities	\$8,170,000	10%	Addition of new impervious surface required treatment for stormwater.
Clean Water Act Section 404 Shoreline Management Act Hydraulic Project Approval Clean Water Act Section 401	ACOE King County WDFW Ecology	Wetlands Restoration	\$7,290,000	9%	Mitigation is needed for roadway widening impacting existing wetlands.
Hydraulic Project Approval (HPA) Shoreline Management Act Clean Water Act Section 401	WDFW King County Ecology	Stream Protection	\$12,470,000	15%	Building longer structures was a condition of obtaining a permit.
Totals			\$27,930,000	34%	



This project, a portion of a larger project to widen SR 18 from Auburn to North Bend, is 3.7 miles of highway located between Maple Valley and the Issaquah Hobart Rd. Scheduled to begin construction in the summer of 2003, its total estimated cost is \$82,080,000.

The project will construct 14 ponds; 3 wet-pools and 11 combination detention pond/wet-pools. Approximately 49% of the project right of way cost is attributed to stormwater detention and treatment. The total cost to treat stormwater will be \$8,170,000. The cost to treat stormwater is expected to increase with the recent discovery of a high water table in the vicinity of some of the ponds.

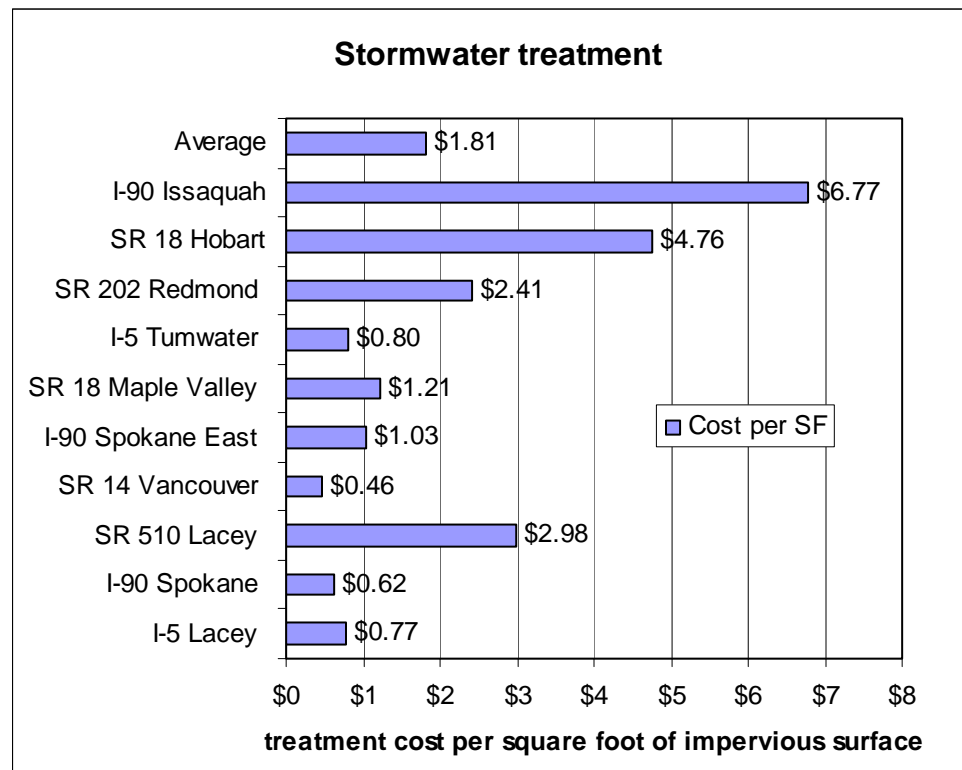
The wetland impact analysis for this project shows unavoidable impacts totaling approximately 7.7 acres. Wetland mitigation is proposed on 4 separate sites located adjacent to SR18 right of way and totaling 49.3 acres of mitigation. The cost of retaining walls, designed to minimize impacts to wetlands, is \$1,688,000. Total cost including design of wetlands is \$7,290,000, or 9% of the total project.

SR18 and 3 county roads cross Taylor Creek and its tributaries in 6 locations within the project limits. The existing crossings are culverts. Four of these crossings will be replaced with a total of 7 bridges. One crossing will be replaced with an 800 ft realignment of Taylor Creek. The 2 bridges over SR169 and a county road will be extended to accommodate this stream realignment. The total cost to extend the structures beyond what is functionally required to span the stream and mitigate for other stream disturbance is \$12,470,000.

Stormwater Control Facilities

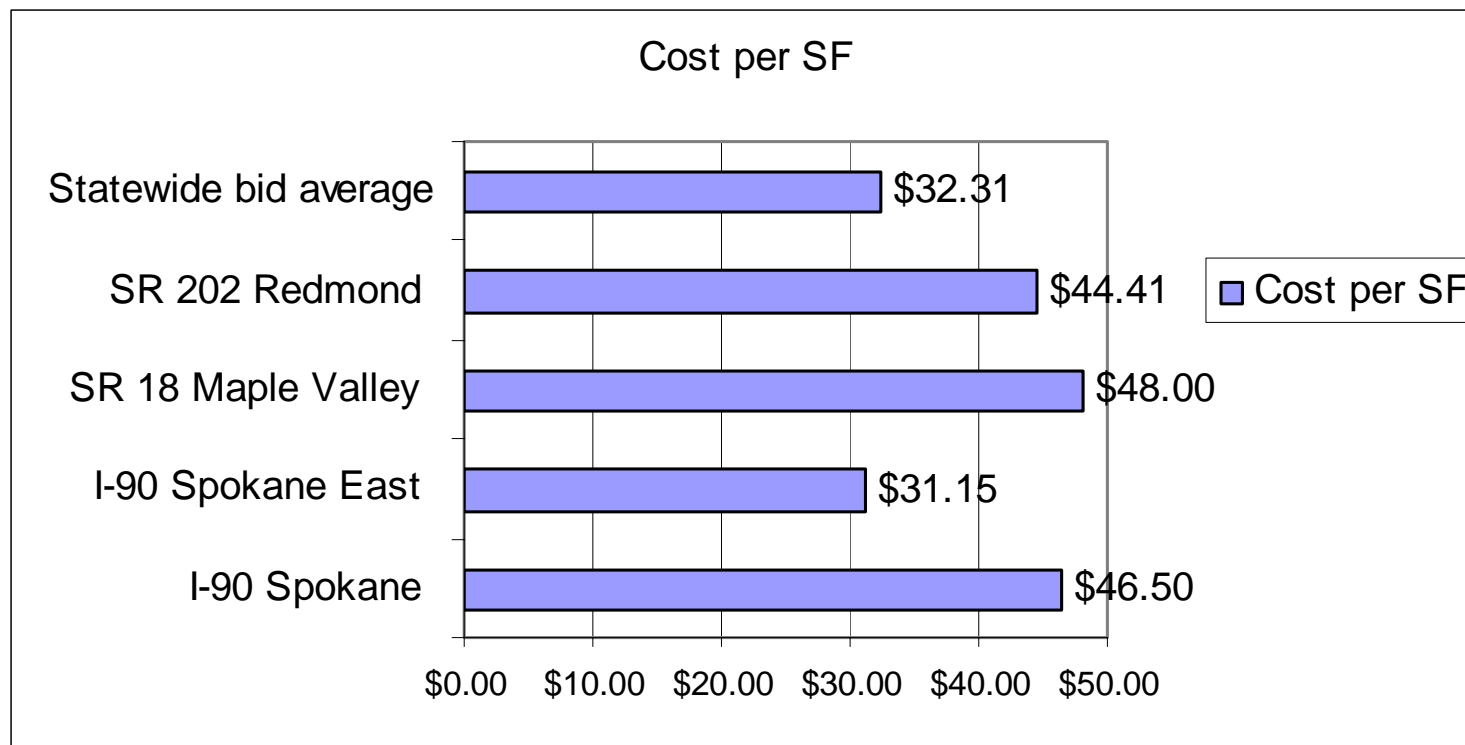
Eight of the projects studied had mitigation for stormwater control. Stormwater control requirements are very site specific, the projects with poor soil conditions or a high water table had considerably higher cost for treating stormwater. Projects that were able to treat the stormwater within the existing right of way cost less than a dollar per square foot for treatment. SR 202 Redmond and SR 510 Lacey are in urban settings and require purchasing commercial and residential property for the pond locations. The SR 18 Hobart project is located in a very wet area. The cost to treat stormwater on this project was more than three times the average cost. The I-90 Issaquah project purchased over \$5 million in right of way for the stormwater ponds.

The total cost to treat stormwater for these ten projects was \$29,000,000. These projects had a total of 356 acres of impervious surface. This is equivalent to about 73 miles of a forty-foot wide two-lane highway..



Noise Walls

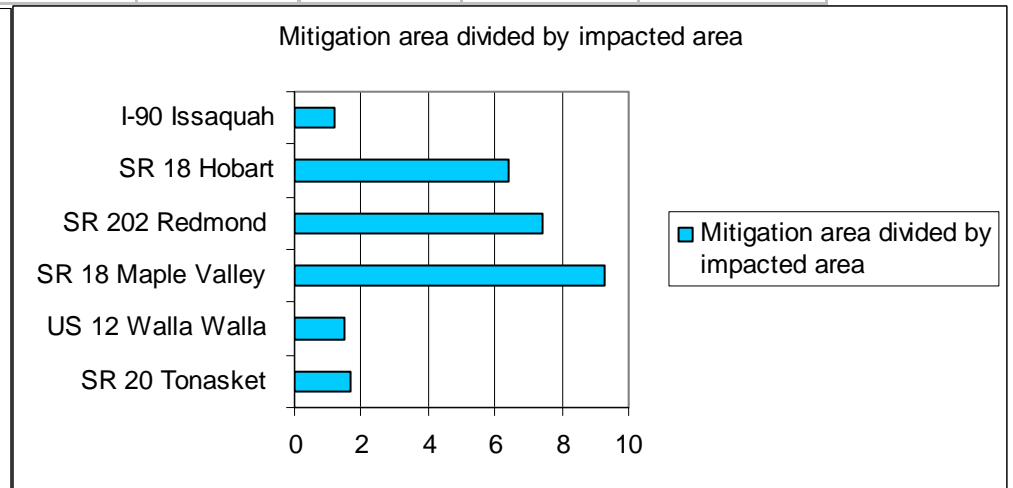
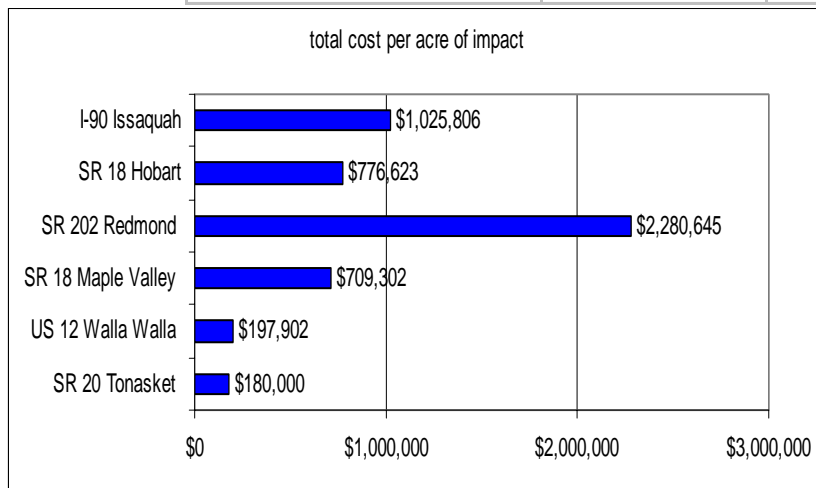
Four of the twelve projects studied included mitigation for noise. Of all of the types of mitigation, noise walls are the most predictable as far as cost. Noise walls are bid by the square foot, and we have a history of previously bid projects to establish a statewide average bid of \$32.31 per square foot. The four projects studied place 120,278 square feet of noise wall for a total cost of \$4,161,000. The average cost for these four projects was \$34.60 per square foot. This was slightly higher than the statewide average, partially due to small quantities on individual projects, such as Maple Valley and Spokane, which have a higher cost per square foot.



Wetlands

Wetland mitigation is the area that has the highest degree of variance from project to project. The class of wetland plays a large role in the amount of mitigation that needs to be done. Another contributing factor is the local jurisdiction in which the project resides. The mitigation ratio is the number of acres replaced divided by the number of acres impacted.

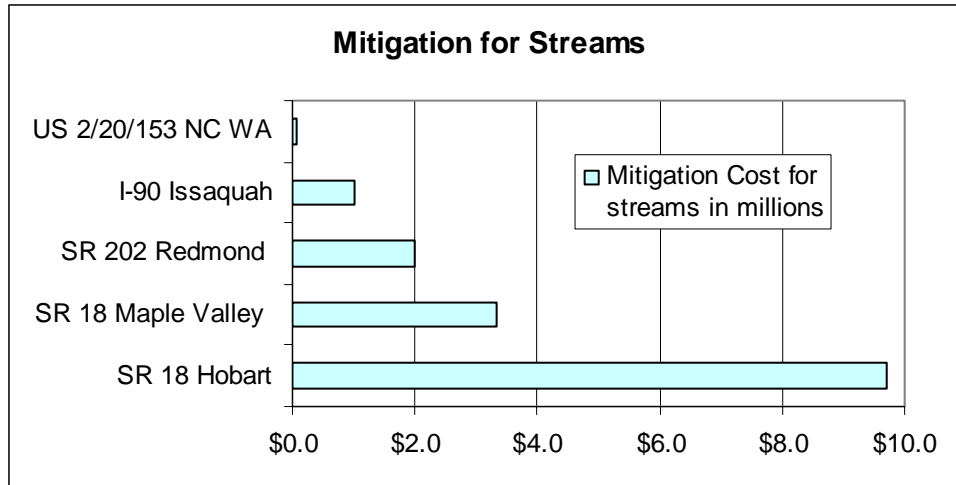
	Wetland mitigation cost	% of project	Acres impacted	Acres of mitigation	Mitigation area divided by impacted area	Total cost per acre of impact
SR 20 Tonasket	\$270,000	6%	1.5	2.5	1.7	\$180,000
US 12 Walla Walla	\$2,830,000	22.40%	14.3	20.9	1.5	\$197,902
SR 18 Maple Valley	\$610,000	2%	0.86	8	9.3	\$709,302
SR 202 Redmond	\$7,070,000	11%	3.1	23	7.4	\$2,280,645
SR 18 Hobart	\$5,980,000	9%	7.7	49.3	6.4	\$776,623
I-90 Issaquah	\$1,590,000	2%	1.55	1.87	1.2	\$1,025,806



Streams

Stream mitigation was required on three of the projects studied. The types of mitigation included repairing the stream bed, revegetating the riparian, and building a larger structure than was functionally required to span the stream. Both SR 18 and SR 202 replaced box culverts and small bridges with longer span bridges that allow for a natural streambed for fish passage and habitat.

	Total project cost in millions	Total mitigation cost in millions	% of project cost spent on mitigation	Mitigation cost for streams in millions
SR 18 Hobart	82.08	27.93		9.72
SR 18 Maple Valley	37.67	7.84	21	3.33
SR 202 Redmond	61.83	15.17	24	2.00
I-90 Issaquah	78.82	18.40		1.01
US 2/20/153 NC WA	0.28	0.06	20	0.06



Environmental Review and Permit List

ENVIRONMENTAL REVIEW										ENVIRONMENTAL PERMITS									
	Final Environmental Impact Statement with Record of Decision	Noise Assessment Study	Clean Air Act	National Historic Preservation Act - Sec. 106	Section 4(f): Wildlife Refuges, Recreation Areas, Historic Properties	**NOAA Consultation - ESA Impact	***USFW Consultation - ESA Impact	Consultation - Tribal	Coastal Zone Management	Hydraulic Project Approval	Army Corps Clean Water Act Section 404 Permit	Growth Management Act Critical Area Ordinances	Shoreline Management Act	Clean Water Act - Section 401 Water Quality Certification	Clean Water Act Section 402 - NPDES Construction Permit	Clean Water Act Section 402 - NPDES Stormwater Site Plan	Ecology Surface Water Quality Modification	Dept. of Natural Resources - Forest Practices	Percent Mitigation
Project Case Study																			
US 2 NC Region Bridge Scour										X	X	X	X		X		X		20%
SR 20 Bannon Creek to Aeneas Valley Rd.										X	X		X		X		X		6%
SR 5 Marvin Rd Interchange and Ramps																X			4%
US 395 Hillsboro St. Interchange	X	X	X	X		X	X								X				10%
I-5 Maytown to 93 rd Ave. 5 th & 6 th Lanes												X				X			15%
US 12 McNary Pool to Atilia	X	X	X	X		X	X	X		X	X	X		X	X				30%
SR 510 Martin Way to Pacific Ave.														X	X				14%
I-90 Evergreen Rd. I/C	X	X	X	X		X	X							X	X			X	12%
SR 14 SE 192 nd Ave. Interchange	X	X	X			X	X			X		X			X			X	2%
I-90 Argonne to Sullivan Interstate Widening	X	X	X		X		X					X			X	X			10%
SR 18 180 th Ave. to Maple Valley						X	X	X		X	X		X	X	X			X	21%
SR 202- SR 520 to Sahalee Way						X	X		X	X	X	X	X	X	X				24%
I-90 Sunset Way I/C Modifications - Stage 2	X		X			X	X			X			X		X	X	X		12%
SR 18 - Maple Valley to Issaquah Hobart Road	X					X	X			X	X		X	X	X	X			34%
*Clean Water Act																			
*National Pollution Discharge Elimination System																			
** National Oceanographic and Atmospheric Administration-Fisheries																			
***United States Fish and Wildlife Service																			

Why do we mitigate for stormwater?

Increases in paved surfaces from roadway construction can contribute to changes in stream flow, stream temperature, water quality and aquifer recharge due to faster stormwater run-off. Additionally, storm events during construction can cause erosion and degraded water quality. WSDOT's stormwater mitigation activities are aimed at minimizing the effects of new impervious surfaces and include strict erosion controls.

Laws and regulations that govern actions affecting stormwater include:

Local Permits and Review

The State Shoreline Management Act (Chapter 90.58 RCW) tasks local governments with establishing shorelines of statewide significance and with creating overall development plans for all shorelines. The Shorelines Management Act regulates stormwater facilities and structures when they are part of a regulated shoreline. Any WSDOT project that proposes placing an outfall or treatment facility that is associated with a regulated shoreline is then subject to regulation under the Shoreline Management Act. The water quality and water quantity discharged by a stormwater facility is not regulated under the Shorelines Management Act. Each county is empowered to enforce elements of the Shorelines Management Act.

The State Growth Management Act (Chapter 36.78 RCW and Chapter 365-195 WAC) requires applicable local governments to establish Critical Area Ordinances for the protection of critical habitats and species. Any WSDOT project that proposes placing an outfall or treatment facility that is associated with a locally regulated critical area will be subject to the local Critical Area Ordinance. The water quality and water quantity discharged by a stormwater facility is not regulated under the Growth Management Act. Each county planning under the Growth Management Act is empowered to adopt and enforce critical area ordinances.

State Permits and Review

The State Environmental Policy Act (SEPA) requires review of potential impacts to stormwater and identification of mitigation opportunities. WSDOT is the lead agency for its projects under SEPA. All agencies with expertise are expected to review documents created by the lead agency. The SEPA administrative code is adopted and updated by the Department of Ecology.

The State's Clean Water Act establishes standards for discharges to state waters and requires that a permit for modification of those standards be obtained if those standards are to be exceeded. The "Water Quality Mod" may contain mitigation requirements. Ecology is charged with enforcing the State Clean Water Act and issuing Water Quality Modifications.

Hydraulic Project Approvals. Chapter 77.55 RCW governs construction projects in state waters and requires the department to get a Hydraulic Project Approval (HPA) from the Department of Fish and Wildlife (WDFW) for all work in state waters. Chapter 220.110 WAC expands on this goal by including all work that may impact state waters. The purpose of this permit is to ensure that the state's aquatic species are not unduly harmed. Controversy exists as to whether WSDOT is required to obtain a Hydraulic Project Approval for stormwater. Recently, WDFW rescinded HPA requirements that they had tried to impose on the Hood Canal Bridge for stormwater impacts, although this is not expected to establish a precedent.

Why do we mitigate for stormwater? (Continued)

Federal Permits and Review

The National Environmental Policy Act (NEPA) applies to all projects that either receive federal funding or are required to obtain federal permits. Potential impacts and mitigation strategies are identified through Environmental Impact Statements (EIS), Environmental Assessments (EA), and Categorical Exclusions (CE). NEPA documents are managed through a federal lead agency, typically the Federal Highway Administration for WSDOT's transportation projects. NEPA is administered by the Environmental Protection Agency. For highway projects, FHWA typically serves as the lead agency for NEPA documentation.

The Endangered Species Act was passed to protect and ensure the long-term viability of avian, terrestrial, aquatic, and marine species of flora and fauna. The United States Fish and Wildlife Service is tasked with managing avian, terrestrial, and aquatic species, while the National Oceanographic Administration Fisheries Service is tasked with managing marine species. The listed species most notable to WSDOT are bull trout and salmon. With the listing of these species, practically every project proposed by the department must be reviewed for compliance with the Endangered Species Act. Each project that receives federal funding must complete a Biological Assessment and obtain a Biological Opinion from both of these agencies prior to construction. The Endangered Species Act does not require a project to mitigate for impacts; however, if a finding of jeopardy for a species is made, the project may not move forward.

The Clean Water Act, Section 402, regulates discharge of stormwater. Stormwater that flows from WSDOT construction sites into river systems is strictly regulated for erosion control under a National Pollution Discharge Elimination System permit. This permit establishes best management practices for erosion control on construction projects. WSDOT also mitigates stormwater for impacts due to increased impervious surfaces under these regulations. Enforcement of Section 402 has been delegated by the Environmental Protection Agency to the Washington State Department of Ecology.

The Coastal Zone Management Act requires protection of coast natural resources such as shellfish and salmon, as well as broader ecological and geological functions of coastal areas. Regulations under the Coastal Zone Management Act have been delegated from the Environmental Protection Agency to the Washington State Department of Ecology.

Tribal Governments Review. Federal treaties between Sovereign Tribal Nations and the federal government require WSDOT to maintain government-to-government relations with 29 federally recognized tribes. This covers cultural, environmental, and economic rights of the tribe related to aquatic species and habitat.

Why do we mitigate for noise impacts?

Construction and traffic noise is a nuisance to both humans and wildlife. Noise can affect human sleeping habits and outdoor recreation. Breeding, foraging, and nesting habits in wildlife can be impacted by construction noise. Local ordinances aim to diminish the effect of short-term construction noise, while the Federal Highway Administration regulates traffic noise.

Laws and regulations that govern actions affecting noise include:

Local Permits and Review

Local ordinances that govern noise are limited to construction activities and vary greatly from jurisdiction to jurisdiction. These ordinances may prohibit certain activities such as pile driving or jack-hammering during certain hours of the day. WSDOT often receives variances from these ordinances. Local governments do not regulate chronic traffic noise.

State Permits and Review

The State Environmental Policy Act (SEPA) requires review of potential impacts due to noise and identification of mitigation opportunities. WSDOT is the lead agency for its projects under SEPA. All agencies with expertise are expected to review documents created by the lead agency. The SEPA administrative code is adopted and updated by the Department of Ecology.

WSDOT Department directive D22-22 and the Priority Study (1985) outline the criteria for traffic noise abatement on existing highways.

Federal Permits and Review

The National Environmental Policy Act (NEPA) applies to all projects that either receive federal funding or are required to obtain federal permits. Potential impacts and mitigation strategies are identified through Environmental Impact Statements (EIS), Environmental Assessments (EA), and Categorical Exclusions (CE). NEPA documents are managed through a federal lead agency; typically the Federal Highway Administration for WSDOT's transportation projects. NEPA is administered by the Environmental Protection Agency. For highway projects, FHWA typically serves as the lead agency for NEPA documentation.

FHWA Noise Standards, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, require a traffic noise analysis for federally funded projects that 1) involve construction of a new highway, 2) significantly change the horizontal or vertical alignment, or 3) increase the number of through traffic lanes on an existing highway. When federal funds are used in project construction, FHWA noise abatement standards must be met.

The Endangered Species Act was passed to protect and ensure the long-term viability of avian, terrestrial, aquatic, and marine species of flora and fauna. Construction noise can have harmful effects on endangered species, including interruption of foraging, breeding, and nesting activities. Each project that receives federal funding must complete a Biological Assessment and obtain a Biological Opinion prior to construction. The Endangered Species Act does not require a project to mitigate for impacts; however, if a finding of jeopardy is made for a species, the project may not move forward.

Why do we mitigate for wetland impacts?

Wetlands perform a broad variety of critical functions for our ecological systems, including providing rearing areas for juvenile salmon, providing flood mitigation, creating rest stops for migratory waterfowl, improving water quality, and providing essential forage, breeding, and nesting areas for a host of species.

Laws and regulations that govern actions affecting wetlands habitats include:

Local Permits and Review

The State Shoreline Management Act (Chapter 90.58 RCW) tasks local governments with establishing shorelines of statewide significance and with creating overall development plans for all shorelines. The Shoreline Management Act explicitly includes wetlands associated with regulated shorelines. Any WSDOT project that impacts a wetland that is associated with a regulated shoreline is then subject to regulation under the Shoreline Management Act. Each county is empowered to enforce elements of the Shoreline Management Act.

The State Growth Management Act (Chapter 36.78 RCW and Chapter 365-195 WAC) requires applicable local governments to establish Critical Area Ordinances for the protection of critical habitats and species. Wetlands are one of the primary land types to be addressed under Critical Area Ordinances. WSDOT must gain local government approval under the Growth Management Act whenever wetlands are impacted. Requirements of these ordinances can vary widely from jurisdiction to jurisdiction. Each county planning under the Growth Management Act is empowered to adopt and enforce critical area ordinances.

State Permits and Review

The State Environmental Policy Act (SEPA) requires review of potential impacts to wetlands and identification of mitigation opportunities. WSDOT is the lead agency for its projects under SEPA. All agencies with expertise are expected to review documents created by the lead agency. The SEPA administrative code is adopted and updated by the Department of Ecology.

The State Clean Water Act establishes standards of discharges to state waters and requires that a permit for modification of those standards be obtained if those standards are to be exceeded. The “Water Quality Mod” may contain mitigation requirements. Ecology is charged with enforcing the State Clean Water Act and issuing Water Quality Modifications.

Hydraulic Project Approvals. Chapter 77.55 RCW governs construction projects in state waters and requires the department to get a Hydraulic Project Approval (HPA) from the Department of Fish and Wildlife for all work in state waters, including wetlands that contain fish habitat. Chapter 220.110 WAC expands on this goal by including all work that may impact state waters. The purpose of this permit is to ensure that the state’s aquatic species are not unduly harmed. WDFW issues Hydraulic Project Approvals.

Why do we mitigate for wetland impacts? (Continued)

Federal Permits and Review

The National Environmental Policy Act (NEPA) applies to all projects that either receive federal funding or are required to obtain federal permits. Potential impacts and mitigation strategies are identified through Environmental Impact Statements (EIS), Environmental Assessments (EA), and Categorical Exclusions (CE). NEPA documents are managed through a federal lead agency, typically the Federal Highway Administration for WSDOT's transportation projects. NEPA is administered by the Environmental Protection Agency.

The Endangered Species Act was passed to protect and ensure the long-term viability of avian, terrestrial, aquatic, and marine species of flora and fauna. The United States Fish and Wildlife Service is tasked with managing avian, terrestrial, and aquatic species, while the National Oceanographic Administration Fisheries Service is tasked with managing marine species. The listed species most notable of to WSDOT are bull trout and salmon. With the listing of these species, practically every project proposed by the department must be reviewed for compliance with the Endangered Species Act. Prior to construction, a Biological Assessment must be completed and a Biological Opinion obtained from both of these agencies for each project that receives federal funding. The Endangered Species Act does not require a project to mitigate for impacts; however, if a finding of jeopardy is made for a species, the project may not move forward.

The Clean Water Act, Section 401, regulates discharge into waters. If wetlands are to be filled, a permit is required under Section 401. Under agreement, the Army Corps of Engineers has delegated authority for Section 401 to the Washington State Department of Ecology.

The Clean Water Act, Section 402, regulates discharge of stormwater. Stormwater that flows from WSDOT construction sites, including stormwater that may flow into wetlands, is strictly regulated for erosion control under a National Pollution Discharge Elimination System permit. Enforcement of Section 402 has been delegated by the Environmental Protection Agency to the Washington State Department of Ecology.

The Clean Water Act, Section 404, regulates dredging and fill in waters, including the drainage of wetlands. Section 404 permits are granted through the United States Army Corps of Engineers (USACOE). USACOE has standards for delineation and mitigation of wetlands that must be followed to obtain a permit for construction of a project that may impact wetlands.

The Rivers and Harbors Act, Section 10, regulates wetlands associated with navigable waters. A recent court ruling states that this law does not apply to isolated wetlands. Permit approvals must be secured to ensure no obstructions to navigable waters occur. This is applicable to many WSDOT bridge activities. Section 10 permits are granted through the United States Army Corps of Engineers.

Why do we mitigate for wetland impacts? (Continued)

The Coastal Zone Management Act requires protection of coast natural resources such as shellfish and salmon, as well as broader ecological and geological functions of coastal areas. This act includes wetlands within Washington's 15 coastal counties. Regulations under the Coastal Zone Management Act have been delegated from the Environmental Protection Agency to the Washington State Department of Ecology.

Tribal Governments Review. Federal treaties between Sovereign Tribal Nations and the federal government require WSDOT to maintain government-to-government relations with 29 federally recognized tribes. This covers cultural, environmental, and economic rights of the tribe related to aquatic species and habitat.

Why do we mitigate for stream impacts?

Streams are vital to the environment, providing both critical habitat and a mechanism for conveyance of water. Impacts on one part of a stream may affect an entire watershed system. Consequently, maintaining the health of streams is essential to providing a healthy environment.

Laws and regulations that govern actions affecting riparian habitats include:

Local Permits and Review

The Shoreline Management Act (Chapter 90.58 RCW) tasks local governments with establishing shorelines of statewide significance and with creating overall development plans for all shorelines. Whenever WSDOT has a construction project in a river, it is required to get a permit from the appropriate local jurisdiction to ensure that shoreline protection requirements are met and that the development is compatible with the local plan.

The State Growth Management Act (Chapter 36.78 RCW and Chapter 365-195 WAC) requires applicable local governments to establish Critical Area Ordinances for the protection of critical habitats and species. Many riparian areas are included in local Critical Area Ordinances.

State Permits and Review

Hydraulic Project Approvals. Chapter 77.55 RCW governs construction projects in state waters and requires the department to get a Hydraulic Project Approval (HPA) from the Department of Fish and Wildlife for all work in state waters. Chapter 220.110 WAC expands on this goal by including all work that may impact state waters. The purpose of this permit is to ensure that the state's aquatic species are not unduly harmed.

Federal Permits and Review

The National Environmental Policy Act (NEPA) applies to all projects that either receive federal funding or are required to obtain federal permits. Potential impacts and mitigation strategies are identified through Environmental Impact Statements (EIS), Environmental Assessments (EA), and Categorical Exclusions (CE). NEPA documents are managed through a federal lead agency, typically the Federal Highway Administration for WSDOT's transportation projects. NEPA is administered by the Environmental Protection Agency.

Why do we mitigate for stream impacts? (Continued)

The Endangered Species Act was passed to protect and ensure the long-term viability of avian, terrestrial, aquatic, and marine species of flora and fauna. The United States Fish and Wildlife Service is tasked with managing avian, terrestrial, and aquatic species, while the National Oceanographic Administration Fisheries Service is tasked with managing marine species. The listed species most notable to WSDOT are bull trout and salmon. With the listing of these species, practically every project proposed by the department must be reviewed for compliance with the Endangered Species Act. Prior to construction, a Biological Assessment must be completed and a Biological Opinion obtained from both of these agencies for each project that receives federal funding. The Endangered Species Act does not require a project to mitigate for impacts; however, if a finding of jeopardy is made for a species, the project may not move forward.

The Clean Water Act, Section 401, regulates discharge into waters. If rivers are to be filled or discharge is made into the river, a permit is required under Section 401. Such a permit may require mitigation of impacts as part of the permit approval. Under agreement, the Army Corps of Engineers has delegated authority for Section 401 to the Washington State Department of Ecology.

The Clean Water Act, Section 402, regulates discharge of stormwater. Stormwater that flows from WSDOT construction sites into river systems is strictly regulated for erosion control under a National Pollution Discharge Elimination System permit. This permit establishes best management practices for erosion control on construction projects. Enforcement of Section 402 has been delegated by the Environmental Protection Agency to the Washington State Department of Ecology.

The Clean Water Act, Section 404, regulates dredging and fill in waters, including rivers. Section 404 permits are granted through the United States Army Corps of Engineers.

The Rivers and Harbors Act, Section 10, regulates all navigable waters. Permit approvals must be secured to ensure no obstructions to navigable waters occur. This is applicable to many WSDOT bridge construction activities. Section 10 permits are granted through the United States Army Corps of Engineers.

The Coastal Zone Management Act requires protection of coast natural resources such as shellfish and salmon, as well as broader ecological and geological functions of coastal areas. Regulations under the Coastal Zone Management Act have been delegated from the Environmental Protection Agency to the Washington State Department of Ecology.

Tribal Governments Review. Federal treaties between Sovereign Tribal Nations and the federal government require WSDOT to maintain government-to-government relations with 29 federally recognized tribes. This covers cultural, environmental, and economic rights of the tribe related to aquatic species and habitat.